

January 16, 2006

Mr. David Staudt  
Center for Disease Control and Prevention  
Acquisition and Assistance Field Branch  
Post Office Box 18070  
626 Cochrans Mill Road – B-140  
Pittsburgh, PA 15236-0295

Re: Contract No. 200-2004-03805, Task Order 1: Draft *Issue Resolution Matrix Based on the SC&A Review of the NIOSH Site Profile for the Hanford Site*

Dear Mr. Staudt:

Enclosed is a draft issue resolution matrix for the Hanford Site Profile Review that was submitted by S. Cohen & Associates (S&A) in June 2005. This matrix was prepared in response to a recommendation of the Site Profile Working Group of the Advisory Board on Radiation and Worker Health at one of its recent meetings. The intent is to initiate an issue resolution process between NIOSH, the Board, and SC&A regarding the key findings of that report. This process is currently underway for the Y-12 review.

Of particular note are three issues that point to the possibility of potentially significant “missing dose.”

The first is the finding that historic neutron exposures of Hanford workers at the reactors and other facilities were not adequately characterized. Neutron-to-photon dose ratios in the NIOSH site profile for use in pre-1972 neutron dose reconstruction are based on non-conservative assumptions, and do not reflect facility design and modification over time. For many Hanford workers, neutron exposure contributed a large fraction of the total dose derived from external radiation; in fact, for the Hanford 200 and 300 Area plutonium facilities likely dominate that dose. The fact that many workers were not monitored for neutron exposure makes it important to establish facility-specific exposure sources and shielding, representative spectral energies, and necessary adjustment factors for dosimetry in use, and changes in operations and facilities over time. This issue is presented in the matrix as comment numbers 1 and 2 for neutron characterization and neutron-to-photon ratios, respectively.

Another issue is a significant finding for missed internal dose at Hanford that is insufficiently addressed in the TBD. Issues not adequately addressed include estimation of uncertainties for bioassay measurements prior to 1981, uncertainty corrections for whole-body counting prior to 1986, and the potential contribution of radioactive contaminants in recycled uranium. This issue is addressed as comment 6 in the matrix.

Finally, the site profile does not adequately account for the production and processing of  $^{233}\text{U}$ , thorium, and polonium, and the extent they contributed to worker exposures, particularly for the peak years of  $^{233}\text{U}$  production in the 1960s to 1970s, and for thorium in the 1950s to 1960s.

We would be pleased to discuss these and other issues cited in the Hanford Site Profile review, as reflected in the enclosed matrix, at your convenience.

Sincerely,

A handwritten signature in black ink, appearing to read "J J Mauro".

John Mauro  
Project Manager

cc: P. Ziemer, PhD, Board Chairperson  
Advisory Board Members  
L. Wade, PhD, NIOSH  
L. Elliott, NIOSH  
J. Neton, PhD, NIOSH  
S. Hinnefeld, NIOSH  
Z. Homoki-Titus, NIOSH  
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S. Ostrow, PhD, SC&A  
K. Behling, SC&A.  
Project File (ANIOS/001/04)

**Table 1: Summary of Task 1 Hanford Site Profile Findings Matrix – Primary Issues**

Comment Number	TBD Number	Finding Number	Issue Number	Issue Description	SC&A Page No	NIOSH Response	Board Action
1	ORAUT-TKBS-0006-6	1	5.1.1 5.1.2 5.1.3	Neutron exposures to reactor workers are not adequately characterized. There is a high potential for worker exposure to neutrons due to historic design and operations of reactors. Not all reactor operations personnel were monitored for neutrons. Number of non-reactor facilities with potential for neutron exposure is not addressed in TBD.	Pg. 30		
2	ORAUT-TKBS-0006-6	1	5.1.4	Neutron-to-photon ratios are derived from <u>very</u> limited neutron measurements and depend on many assumptions. Neutron spectra and n/p ratios have facility-specific deficiencies and were based on nonconservative assumptions; pre-1972 workers may have been exposed to radiation fields with neutron-to-photon ratios well in excess of those cited in TBD.	Pg. 37		
3	ORAUT-TKBS-0006-5	2	5.2	Questionable air sampling assumptions and lack of clear technical bases undercut the TBD's derivation of intakes in the years prior to implementation of routine bioassay programs at Hanford. More thorough evaluation is needed of uncertainties in the actual bioassay techniques, and instruments used to quantify internal dose and the MDAs.	Pg. 46		
4	ORAUT-TKBS-0006-6	3	5.3.1 5.3.2 5.3.4 5.3.5	Use of correction factors, and uncertainty and bias factors for TLDs and film badge readings are not clear in the TBD. TBD presents options for determining missed photon dose, but these options could result in inconsistencies in dose reconstruction. Adjustment factors for the large variety of geometries at Hanford are not provided. TBD does not use same method (based on MDLs) to calculate missed photon and neutron dose.	Pg. 51		
5	ORAUT-TKBS-0006-6		5.3.3	TBD does not consider acute beta doses and routine non-penetrating doses for extremity, skin, gonads, and breast exposures.	Pg. 55		
6	ORAUT-TKBS-0006-5	4	5.4	There is a significant potential for missed internal dose that is not sufficiently addressed for potentially thousands of workers. Issues include: significant reduction on annual bioassays for site workers after 1959; estimation of uncertainties prior to 1986; and potential contribution of radioactive contaminants from recycled uranium in the 200 and 300 Areas.	Pg. 57		

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Comment Number	TBD Number	Finding Number	Issue Number	Issue Description	SC&A Page No	NIOSH Response	Board Action
7	ORAUT-TKBS-0006-4	5	5.5	Modeling of occupational exposures due to Hanford environmental releases is not as claimant favorable as it should be because the RACHET model is apparently not applied to daily episodic airborne releases; and is not necessarily applicable for particles greater than 0.5 micron. Also, large onsite worker dose estimates, particularly for inhalation of transuranics and non-volatile beta-emitters released around the time of chemical separation stack releases in the 1940s and 1950s have not been reconciled for potential claimants.	Pg. 75 Pg. 82		
8	ORAUT-TKBS-0006-5	6	5.6	The Tank Farm characterization in the TBD is inadequate for dose reconstruction guidance for several reasons, including: List of radionuclides cited is incomplete, increasing the potential for missed dose; and TBD does not reflect complete description and characterization of past and current environmental restoration and waste management operations.			
9	ORAUT-TKBS-0006-5,6	7	5.7	Worker doses are not accounted for properly for production of <sup>233</sup> U in the 100, 200 and 300 Areas, as well as for thorium and polonium sources historically present in Hanford operations.	Pg. 87		
10	ORAUT-TKBS-0006-4,5,6	8	5.8	TBD is incomplete with respect to remediation and disposal sites. Numerous environmental waste streams and cribs that existed in the past are not addressed. D&D operations may have presented unusual internal and external exposures that were not monitored, or were not properly characterized, especially for site-wide workers/rovers.	Pg. 93		
11	ORAUT-TKBS-0006	9	5.9	The method of locating, evaluating, and integrating incident data into the dose reconstruction is not clear in the Hanford TBDs. Partial data on incidents indicate significant external and internal doses to reactor and waste management workers. Similar problems may have occurred at chemical separation facilities and 300-Area facilities. NIOSH should search for records that can provide additional information on doses resulting from accidents and incidents. There is a need for a method to identify and assign doses to non-monitored workers involved in accidents/incidents who do not have dose records.	Pg. 97		